

Posticobia norfolkensis (Sykes), an apparently-extinct, fresh-water Snail from Norfolk Island (Gastropoda: Hydrobiidae)

W. F. PONDER

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Recent sampling on Norfolk Island has indicated that *Paludestrina norfolkensis* Sykes 1900 is almost certainly extinct. The original material collected in 1855 and samples collected in 1909 and 1913 are the only reliably-dated material that has been located in collections. It is assumed that this species became extinct following damage to the fresh-water habitats by forest clearing and subsequent stock activity. Examination of the dried remains of the animal indicate that it is very closely related to *Posticobia brazieri* (Smith 1882), an eastern Australian species.

W. F. Ponder, *The Australian Museum, P.O. Box A285, Sydney South, Australia 2000*; manuscript received 18 June 1980, accepted for publication 23 July 1980.

INTRODUCTION

Norfolk Island (Lat. 29°S, Long. 168°E) is a small volcanic island, 676 km from New Caledonia and 1,368 km from eastern Australia. Its small size and isolation have resulted in the evolution of a largely endemic fauna and flora. Unfortunately several endemic plant and animal species are in danger of extinction or have already become extinct (Turner *et al.*, 1968).

The writer and Mr E. K. Yoo visited Norfolk Island in June 1979 to determine the present distribution of a small, endemic, fresh-water snail, *Paludestrina norfolkensis* (Hydrobiidae), described by Sykes (1900). Fresh-water habitats were sampled at 20 stations (Fig. 1) but failed to reveal the presence of any fresh-water molluscs. An additional 21 temporary water courses were examined and found to be dry at the time of the survey. Many terrestrial habitats were also sampled during the survey.

Paludestrina norfolkensis was named from specimens collected by John Macgillivray during a voyage of HMS "Herald" to Norfolk Island in May, 1855. Other dated collections (see details below) extend to 1913. No dated material collected since 1913 has been located.

The available material contains the dried remains of animals and from these were extracted the radula and operculum which were examined using the SEM (for details of methods see Ponder and Yoo, 1976).

TAXONOMY

Family Hydrobiidae

Genus *Posticobia* Iredale 1943

Type species (original designation): *Hydrobia brazieri*

Smith 1882; Recent, eastern Australia

The type species of *Posticobia* has a shell, radula and operculum (Fig. 2, 6-8)

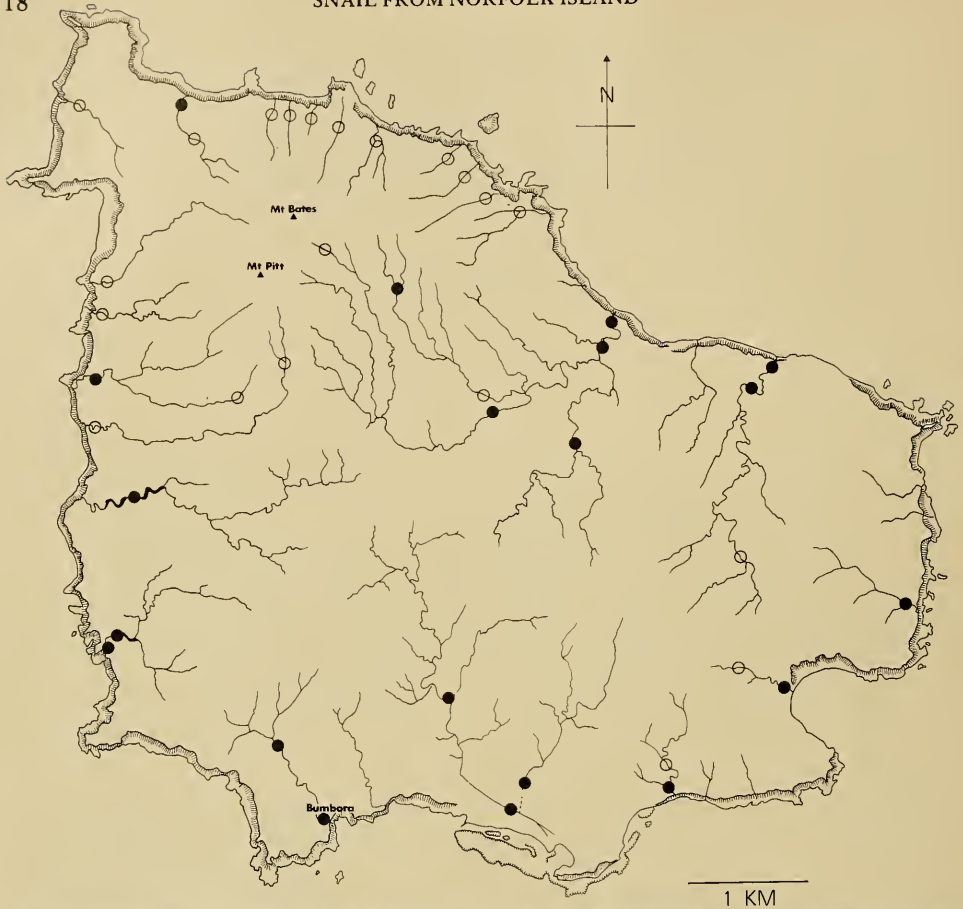


Fig. 1. Norfolk Island, showing localities sampled. The open circles indicate water-courses that were dry at the time of the survey. The closed circles indicate stations where water was present.

very similar to that of *Paludestrina norfolkensis* (Fig. 2, 1-5). These two species appear to be the only members of this genus. *Tatea* T. Woods, is, perhaps, the most closely related genus but species in this group differ in having much more narrowly-conical shells. A review of the Australian hydrobiid genera will be published elsewhere.

Posticobia norfolkensis (Sykes, 1900). Fig. 2, 1-5.

Paludestrina norfolkensis Sykes, 1900: 146, pl. 13, fig. 14.

Remarks: The shell differs from all known species of Hydrobiidae in the Australasian region by its broadly ovate shape, somewhat D-shaped aperture weakly angled anteriorly and posteriorly, rather thickened peristome, small umbilical chink and rounded to subangled periphery (Fig. 2, 1). The shell of the Australian species, *P. brazieri* (Fig. 2, 7) is thinner, has a peripheral keel or marked peripheral angulation, a slightly taller spire, and a less strongly prosocline outer apertural lip.

The opercula of *P. brazieri* and *P. norfolkensis* are similar in having a row of small pegs on their inner surfaces (Fig. 2, 2, 3, 6). The radulae of both species are also almost identical; the formula of the central teeth (Fig. 2, 4, 5, 8)

$$\frac{4 + 1 + 4}{(3 - 4) + (4 - 3)}$$

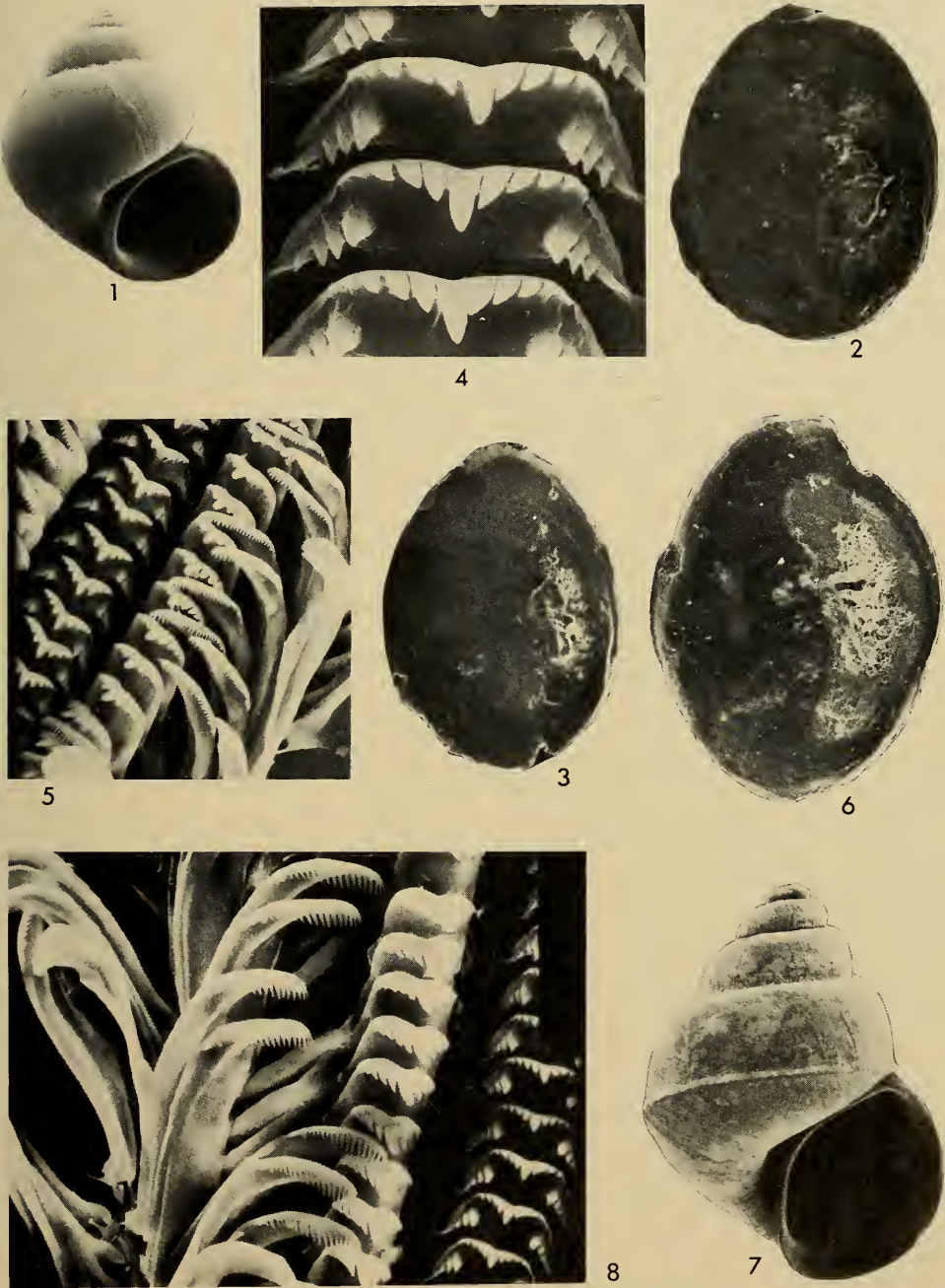


Fig. 2. 1-5. *Posticobia norfolkensis* (Sykes), Bumbora, Norfolk Island. 1, shell; 2, 3, opercula (inner side); 4, central teeth of radula; 5, a portion of the radula. 6-8. *Posticobia brazieri* (Smith), South Grafton, Clarence River, New South Wales. 6, operculum; 7, shell; 8, a portion of the radula.

lateral teeth 4 + 1 + 4 in *P. norfolkensis* and 4 + 1 + (4 - 5) in *P. brazieri*. The marginal teeth have numerous small denticles (Fig. 2, 5, 8).

Material examined: Syntypes, Norfolk Island, ex Admiralty Colln., BMNH*, 1856.10.27.94 (32 specimens). Bumbora, coll. F. A. Bassett-Hull, 1909, AMS**, C.30992 (33 specimens). Bumbora, (collected R. Bell?), 7.vi.1913 (many specimens), BMNH, 1932. 25.300-319. Same data but lacking date, BMNH, 1931. 12.29.206-225 (many specimens). Norfolk Island, pres. C. Hedley, purchased from H. Preston, AMS, C.34522 (4 specimens). Norfolk Island, no other data, BMNH, 58.3.19.511 (1 specimen). Norfolk Island, ex Bryant Walker Colln., MZUM***, 137772 and 48595/119233 (2 lots, 5 specimens).

Dimensions of Syntypes:

Length (mm)	Width (mm)
2.36	1.94
2.40	2.12
2.53	2.04
2.40	2.06

DISCUSSION

All of the permanent fresh-water bodies and many of the temporary creeks on Norfolk Island were examined during the survey. The result was negative so it is concluded that *P. norfolkensis* is now almost certainly extinct. The rather large numbers of specimens comprising the museum material available suggests that the species was once abundant, at least at Bumbora.

The Island was uninhabited when Captain James Cook discovered it in 1774. It was first settled in 1788 but was only partly cleared in 1856 when the Pitcairn Islanders arrived there to settle. Now only a small proportion of the land-surface is covered with original vegetation (Turner *et al.*, 1968).

There is little doubt that man-made environmental changes affecting the fresh-water streams on the island have led to the probable extinction of *P. norfolkensis*. These changes include: — (a) Clearing of the forest allowing greater penetration of sunlight leading to greater algal and other plant growth and increased evaporation, causing pools to dry out more frequently. (b) Grazing by cattle causing damage to stream beds and fouling of water. (c) Erosion through clearing and stock damage causing shallowing of stream beds and increasing silt load. (d) Building of dams on streams resulting in changes of habitat and altering of water flow below the dams. (e) Introduction of chemicals (fertilizers, pesticides etc.) to the land and their subsequent drainage into streams.

All or some of these factors may have been responsible for the probable extinction of *P. norfolkensis*. The most obvious damage seen during the survey was inflicted by cattle on the banks and beds of streams leading to erosion of the banks, fouling of pools and extreme disturbance to the stream beds. We could not find a pool or stretch of stream bed that did not show signs of cattle damage, even in the Mount Pitt Reserve.

The apparent close relationship of *P. norfolkensis* to the eastern Australian *P. brazieri* is of interest, particularly as none of the species comprising the relatively large hydrobiid fauna of Lord Howe Island (Lat. 31° 33'S, Long. 159° 05'E) is closely related to these species. *Posticobia brazieri* was probably transported to Norfolk Island

* BMNH = British Museum (Natural History), London

** AMS = The Australian Museum, Sydney

*** MZUM = Museum of Zoology, University of Michigan, Ann Arbor, Michigan.

by birds during the Pleistocene or Holocene and subsequently differentiated. The fresh and brackish-water habitats where *P. brazieri* occurs have a rich bird fauna so that the accidental dispersal of this species is not improbable. The rocky streams of Lord Howe Island do not provide the same opportunities for mud (containing snails) accidentally to adhere to feet, bills or feathers of birds. The extremely limited distributions of the fresh-water snails on Lord Howe Island itself indicate their inability to disperse readily by this or any other means (Ponder, in MS). Hydrobiids on the Australian mainland, however, where muddy streams and rivers are common, are generally widely distributed.

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